THUNDER Overview for Schriever 2001

Mr. Damon Lum

SPACE WARFARE CENTER

EMERGENT
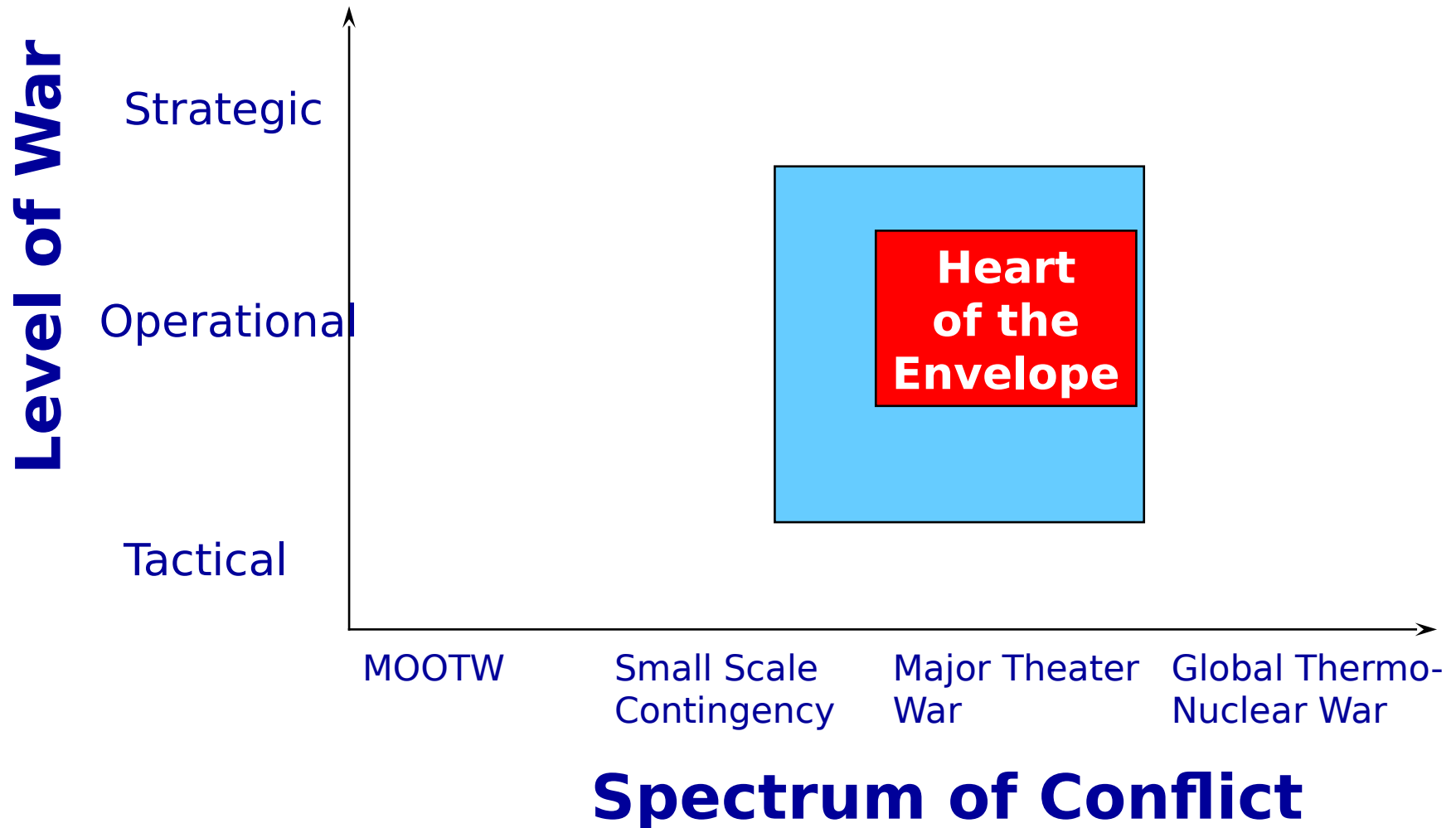Information Technologies, Inc.

Model Overview

- **THUNDER is the Air Force's theater-level analytical campaign simulation**
  - **Two-sided, stochastic simulation**
  - **Developed by US Air Force Studies and Analyses Agency**
  - **Deterministic ground war attrition based on US Army's CAA combat models**
- **Focuses primarily on**
  - **Planning and execution of the aerospace and ground war as constrained by logistics, ISR, weather, etc. and their interactions at the campaign level**
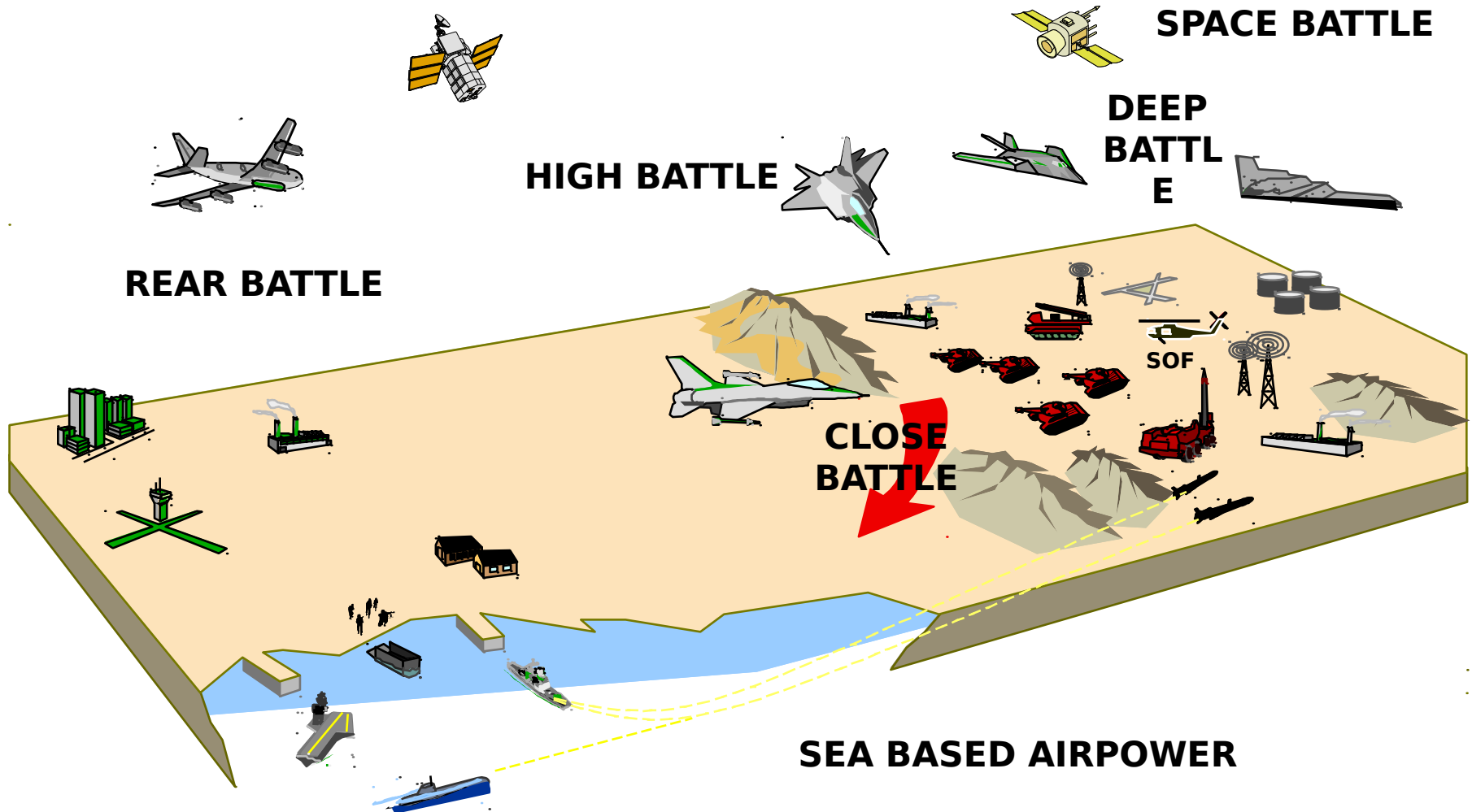
2

THUNDER's Domain

Level of War

Strategic

Operational

Tactical

Heart of the Envelope

MOOTW | Small Scale Contingency | Major Theater War | Global Thermo-Nuclear War

Spectrum of Conflict

3

Joint Force Commander's Perspective

SPACE BATTLE

DEEP BATTLE

HIGH BATTLE
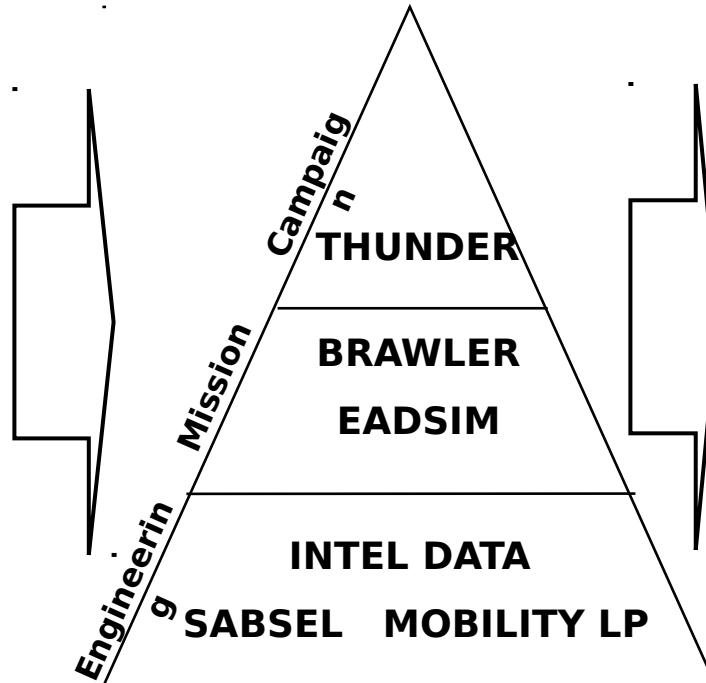
REAR BATTLE

SOF

CLOSE BATTLE

SEA BASED AIRPOWER

4

Analytic Process

Quantify the contribution of alternative weapon systems or force structures to the combat outcomes for key operational objectives

ALTERNATIVES	ANALYSIS TOOLS	MEASURES OF OUTCOME

ALTERNATIVES

1. **Base Case, DSP**

2. **SBIRS High**

3. **SBIRS High + P4I**

4. **SBIRS High + P4I +**
   SBIRS Low

ANALYSIS TOOLS

Campaign — THUNDER

Mission — BRAWLER / EADSIM

Engineering — INTEL DATA / SABSEL   MOBILITY LP

MEASURES OF OUTCOME

Gain control of the air

Halt the invading army

Destroy enemy war supporting infrastructure

Destroy the occupying army

Eject the occupying army

Destroy enemy leadership

Destroy enemy infrastructure for reconstitution

Manage the cost of the campaign (losses)

THUNDER Inputs I

- **"Hard Data" -- bean counts and locations of "things"**
  - **Air orders of battle**
  - **Ground orders of battle and unit TO&E's**
  - **Air defense/missile orders of battle**
  - **Infrastructure data such as:**
    - **Logistics Facilities**
    - **Transportation Network**
    - **Satellite constellations**
  - **Strategic targets**
    - **Weapons R&D**
    - **Electric power**
    - **National C3**

6

THUNDER Inputs II

- **"Soft Data" -- Strategy, operational art, tactics**
  - **Flight tactics, escort ROE, support package makeup**
  - **Ground unit movement orders, defensive strength, offensive potential**
  - **Air defense fire doctrine, degraded modes**
  - **Repair and engineering data**
  - **Typically the most difficult to build**
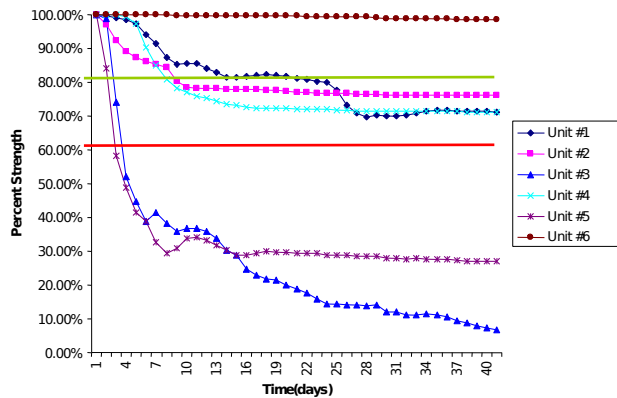 - **Often subject to critiques from outside observers**

7

THUNDER Output Examples

- **Graphics**
  - **Graphs**
  - **Situation Map**
- **Reports**
  - **Air-to-Air Encounters/Kills**
  - **Surface-to-Air Encounters/Kills**
  - **Equipment Kills**
  - **Munitions Expenditures**
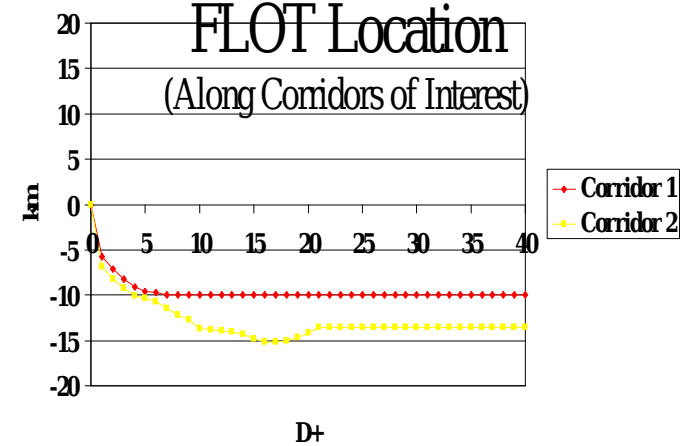- **Database Output**
  - **Who shot John?**
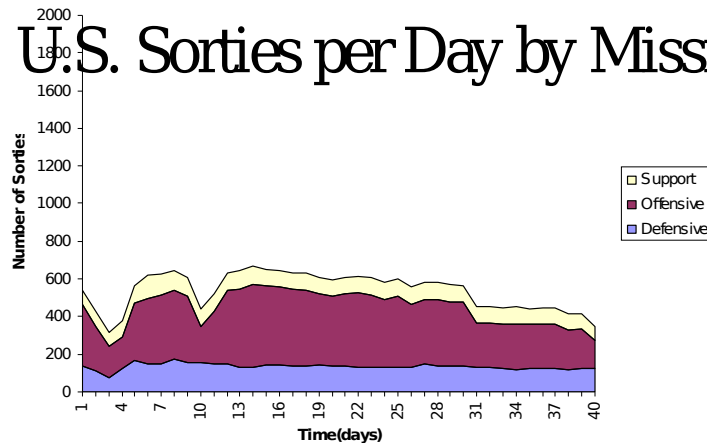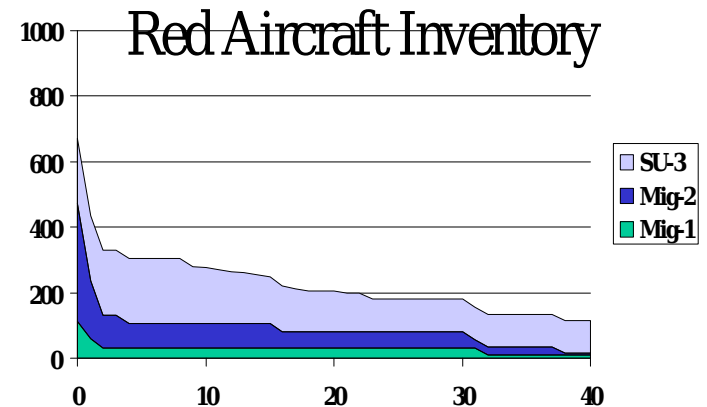
8

Sample Results

Red Ground Force Drawdown

FLOT Location
(Along Corridors of Interest)

U.S. Sorties per Day by Mission

Red Aircraft Inventory

9

Purpose in Schriever 2001

- **THUNDER provides campaign metrics for Schriever 2001**
  - **Focus**
    - **Provides bounds of possible outcomes of courses taken by players**
    - **Provide assessors regimes from which to challenge players**
  - **Strengths**
    - **Provides campaign insights on courses of action**
    - **Provides analytical foundation for subsequent analyses**
  - **Weaknesses**
    - **Does not have fidelity of mission or engagement models**
    - **Communications is difficult to capture**
    - **Naval portrayal limited to air warfare**

10

In Game Support

- **Provide campaign level metrics for assessors**
  - **36 pre-run cases to cover a spectrum of conditions**
  - **Player moves outside this spectrum will require overnight assessment**
    - **Inputs: typically less than 60 min**
    - **Average Model Run: ~4 hours (30 days of combat)**
    - **Analysis Time: ~45 min**
  - **Products**
    - **Campaign metrics-- FLOT movement, Ground unit and air strengths, Selected target drawdowns, attrition reports**
  - **Results coordinated with EADSIM and other SMEs for integrated assessment**

11

Summary

- **Focus for Schriever 2001 is campaign results**
  - **During the game, assessments based on pre-game results**
    - **General losses**
    - **Air situation**
    - **Ground situation**
  - **Overnight assessments to support unanticipated player moves**
  - **Mature databases and lessons learned for subsequent analyses**

12